

1 39. The device comprising a combination of a piston and a chamber according  
2 to claim 37, wherein the piston and/or the chamber comprise supporting means.

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**REMARKS**

This is a Section 371 national application based on International Application No. PCT/DK99/00227, filed April 22, 1999. The PCT application was unintentionally abandoned by Applicant but is revived by a petition and appropriate fee filed herewith.

The amendments to Claims 1-39 are to conform the claims to United States practice. If the Examiner believes that a telephone interview will help further the prosecution of this case, Applicant respectfully requests that the undersigned attorney be contacted at the listed telephone number.

Respectfully submitted,



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**VERSION WITH MARKINGS TO SHOW CHANGES MADE****IN THE SPECIFICATION:**

Please insert the statement of priority above the "TECHNICAL FIELD" as follows:

This is a Section 371 national patent application based on International Application No. PCT/DK99/00227, filed on April 22, 1999. International Application No. PCT/DK99/00227 is incorporated herein by reference.

**IN THE CLAIMS:**

Please amend Claims 1-39 as follows:

**What is claimed is:**

- 1           1.     A device comprising a combination of a chamber and a piston positioned  
2     inside the chamber, said chamber and said piston relatively movable to each other in a  
3     predetermined direction of movement between a first position and a second position,  
4     wherein [characterized by the fact that],  
5                 the cross-section of the chamber [(1, 21, 60, 70, 90, 169, 216, 231)] in a  
6     plane perpendicular to the direction of movement is larger at the first position than at the  
7     second position;  
8                 the change [( 16, 17, 18, 66, 67, 68, 69, 72, 74, 151, 153, 160, 161)] of the  
9     cross-section of the chamber [(1, 21, 60, 70, 90, 169, 216, 231)] is essentially continuous  
10    between the first position and the second position; and,  
11                 the cross-section of the piston [(20, 20', 36, 36', 49, 49', 50, 50', 59, 59', 76, 76',  
12    92, 92', 118, 118', 138, 138', 146, 146', 168, 168', 189, 189', 208, 208', 222, 222', 222'')]  
13    is arranged to adapt itself to the cross-section of the chamber [(1, 21, 60, 70, 90, 169, 216,  
14    231)].
- 1           2.     A device comprising a combination of a chamber and a piston positioned  
2     inside the chamber, the chamber and the piston relatively movable to each other in a  
3     predetermined direction of movement between a first position and a second position,

4 [characterized by the fact that] wherein,

5 [-] the cross-section of the piston [(230)] in a plane perpendicular to the direction of  
6 movement is larger at a first piston position than at a second piston position,

7 [-] the change of the cross-section of the piston [(230)] is essentially continuous  
8 between the first piston position and the second piston position,

9 [-] the cross-section of the chamber [(231)] in a plane perpendicular to the direction  
10 of movement is larger at the first position than at the second position,

11 [-] the change of the cross-section of the chamber is essentially continuous between  
12 the first position and the second position and

13 [-] the cross-section of the chamber [(231)] is arranged to adapt itself to the cross-  
14 section of the piston [(230)].

1 3. A device comprising a combination of a chamber and a piston positioned  
2 inside the chamber, said chamber and said piston relatively movable to each other in a  
3 predetermined direction of movement between a first position and a second position,

4 [characterized by the fact that] wherein

5 [-] the cross-section of the piston [(20, 20', 36, 36', 49, 49', 50, 50', 59, 59', 76, 76',  
6 92, 92', 118, 118', 138, 138', 146, 146', 168, 168', 189, 189', 208, 208', 222, 222',  
7 222'')] in a plane perpendicular to the direction of movement is larger at a first piston  
8 position than at a second piston position,

9 [-] the change of the cross-section of the piston [(20, 20', 36, 36', 49, 49', 50, 50', 59,  
10 59', 76, 76', 92, 92', 118, 118', 138, 138', 146, 146', 168, 168', 189, 189', 208, 208', 222,  
11 222', 222'')] is essentially continuous between the first piston position and the second  
12 piston position,

13 [-] the cross-section of the chamber [(231)] in a plane perpendicular to the direction  
14 of movement is larger at the first position than at the second position,

15 [-] the change of the cross-section of the chamber [(231)] is essentially continuous  
16 between the first position and the second position and

17 [-] a cross-section of the chamber [(231)] and the piston [(20, 20', 36, 36', 49, 49', 50,  
18 50, 59, 59', 76, 76', 92, 92', 118, 118', 138, 138', 146, 146', 168, 168', 189, 189', 208,  
19 208', 222, 222', 222'')] respectively is arranged to adapt itself to the cross-section of the

20 piston [(20, 20', 36, 36', 49, 49', 50, 50', 59, 59', 76, 76', 92, 92', 118, 118', 138, 138', 146,  
21 146', 168, 168', 189, 189', 208, 208', 222, 222', 222'')] and the chamber [(231)],  
22 respectively.

1           4.     The [A] device comprising a combination of a chamber and a piston of  
2 Claim 1 [according to claim 1, 2 or 3 characterized by the fact that] wherein the  
3 circumference of the cross-section perpendicular to the direction of movement of the  
4 chamber [(162)] and/or the piston [(163)] where [at] at least one part of said chamber  
5 and/or said piston, is constant between and including said first position and said second  
6 position.

1           5.     The [A] device comprising a combination of a chamber and a piston according to  
2 claim 4, [characterized by the fact that] wherein said cross-section  
3 [-] consisting of sectors [(152, 154)], wherein in each sector the distance between the  
4 centerpoint of the cross-section of the chamber [(162)] and the outermost limiting surface  
5 of the chamber is larger than the corresponding distance measured along a line separating  
6 the sector from an adjacent sector, and  
7 [-] the change [(151, 153)] of the shape between two adjacent sectors is essentially  
8 continuous.

1           6.     The [A] device comprising a combination of a chamber and a piston  
2 according to claim 1[, 2 or 3, characterized by the fact that] wherein the cross-section of  
3 the chamber [(1, 21, 60, 70, 90, 169, 216, 231)] is circular at any point between and  
4 including the said first position and second position.

1           7.     The [A] device comprising a combination of a chamber and a piston  
2 according to claim 1[, 2 or 3, characterized by the fact that] wherein the piston comprises  
3 a sealing portion [(8, 8', 20, 20', 25, 25', 36, 36', 40, 40', 41, 41', 48, 49, 49', 50, 50', 58,  
4 59, 59', 76, 76', 80, 80', 83, 92, 92', 102, 102', 112, 117, 118, 118', 129, 133, 138, 138',  
5 146, 146', 167, 167', 168, 168', 185, 188, 189, 189', 198, 198', 208, 208', 209, 220, 220',  
6 222, 222', 222'', 235)] made of an elastically deformable material and/or a loading portion  
7 [(9, 9', 31, 42, 51, 54, 54', 100, 101, 103', 124, 124', 130, 131, 136, 137, 173, 173', 174,

174', 181, 205, 205', 206, 215, 215', 219, 219', 232, 233, 237)) and/or a support portion [(10, 28, 31, 42, 43, 84, 184)].

8. The [A] device comprising a combination of a chamber and a piston [Piston] according to claim 7, [characterized by the fact that] wherein the sealing portion [(8, 8', 25, 185, 209, 79, 80, 80', 130, 131, 132, 133, 170, 171, 172, 190)] in cross-section of the piston [(20, 20', 36, 36', 59, 59', 76, 76', 189, 189', 146, 146', 168, 168', 208, 208', 222, 222', 222'')] parallel to the direction of movement has a general form of an area which is bound by a curve and/or line with specific predetermined mathematical characteristics in which the said adaptation of the cross-section of said piston in a plane perpendicular to the direction of movement corresponds to a change in a value of a characteristic in a direction perpendicular and/or in a direction of the movement of said piston and/or said chamber [(1, 21, 60, 70, 90, 162, 169, 216, 231)].

9. The [A] device comprising a combination of a chamber and a piston according to claim 8, [characterized by the fact that] wherein the sealing portion [(25)] in a cross-section of the piston [(36, 36')] in a plane parallel to the direction of movement has the general form of an area bounded by a rectangular having a predetermined length of its sides, in which the said adaptation of the cross-section of the piston [(36, 36')] in a plane perpendicular to the direction of movement corresponds to a change in the length of a side of said rectangular perpendicular to the direction of movement and is accompanied by an opposite change in the length of a side along the direction of movement.

10. The [A] device comprising a combination of a chamber and a piston according to claim 9, [characterized by the fact that] wherein the change of the length of said side along the direction of movement is accompanied by a change in the shape of said rectangular.

11. The [A] device comprising a combination of a chamber and a piston according to claim 8, [characterized by the fact that] wherein the sealing portion [(8, 8', 80, 80', 185, 209)] in a cross-section of the piston [(20, 20', 59, 59', 189, 189'')] in a plane parallel to the direction of movement has the general form of the obliques of a triangle of

5 which its [perpendicular] perpendicular being parallel with the direction of movement, the  
6 obliques of [the] said triangle extending outwards from [the] said [perpendicular]  
7 perpendicular in a predetermined angle ( $\alpha_1, \epsilon_1$ ) wherein the said adaptation of the cross-  
8 section of the piston [(20, 20', 59, 59', 189, 189')] in a plane perpendicular to the direction  
9 of movement corresponds to a change in the said predetermined angle ( $\alpha_2, \epsilon_2$ ).

1 12. The [A] device comprising a combination of a chamber and a piston  
2 according to claim 8, [characterized by the fact that] wherein the sealing portion [(79,  
3 80)] in a cross-section of the piston [(76, 76')] a plane parallel to the direction of  
4 movement has the general form of an area which is bound by [a] approximately a triangle,  
5 a [perpendicular] perpendicular being parallel to the direction of movement and the  
6 obliques of the said triangle extending outwards from [the] said [perpendicular]  
7 perpendicular in a predetermined angle  $\phi_1$ , wherein [the] said adaptation of the cross-  
8 section of the piston in a plane perpendicular to the direction of movement corresponds to  
9 a change in the said predetermined angle  $\phi_2$ .

1 13. The [A] device comprising a combination of a chamber and a piston  
2 according to claim 11 [or 12], [characterized by the fact that] wherein [the] said  
3 predefined angle ( $\alpha_1, \epsilon_1, \phi_2$ ) is larger at the first position than at [the] said second position.

1 14. The [A] device comprising a combination of a chamber and a piston  
2 according to claim 8, [characterized by the fact that] wherein the sealing portion [(130,  
3 131, 132, 133, 170, 171, 172, 190)] in a cross-section of the piston [(146, 146', 168, 168',  
4 208, 208')] in a plane parallel to the direction of movement has the general form of an  
5 area which is bound by a circle having a predetermined radius, a central axis parallel to  
6 the direction of movement and, wherein the said adaptation of the cross-section of the  
7 piston [(146, 146', 168, 168', 208, 208')] in a plane perpendicular to the direction of  
8 movement corresponds to a change in the said radius.

1 15. The [A] device comprising a combination of a chamber and a piston  
2 according to claim 14, [characterized by the fact that] wherein [the] said adaptation is  
3 accompanied by an opposite change of the radius in the direction of movement.

1           16.    The [A] device comprising a combination of a chamber and a piston  
2 according to claim 8, [characterized by the fact that] wherein the sealing portion in a  
3 cross-section of the piston [(222, 222', 222'')] in a plane parallel to the direction of  
4 movement has the general form of an area which is bounded by a rhomboid, which has a  
5 predetermined length of its axis, one of the axis parallel to the direction of movement,  
6 wherein said adaptation of the cross-section of the piston in a plane perpendicular to the  
7 direction of movement corresponds with a change in the length of an axis and an opposite  
8 change in the length of the other axis.

1           17.    The [A] device comprising a combination of a chamber and a piston  
2 according to claim 8, [characterized by the fact that] wherein the sealing portion in a  
3 cross-section of the piston [(222, 222', 222'')] in a plane parallel to the direction of  
4 movement has the general form of an area which is bounded by an ellipse, which has a  
5 predetermined length of its axes [axes], one [of the] axis parallel to the direction of  
6 movement, wherein said adaptation of the cross-section of the piston in a plane  
7 perpendicular to the direction of movement corresponds with a change in the length of an  
8 axis and an opposite change in the length of the other axis.

1           18.    The [A] device comprising a combination of a chamber and a piston  
2 according to claim 8, [characterized by the fact that] wherein the sealing portion in a  
3 cross-section of the piston [(92, 92')] in a plane parallel to the direction of movement  
4 comprises parts (X, Y, Z) which are preformed, having in between predetermined angles  
5 ( $k_1, \lambda$ ) where said part X having a predetermined angle  $\eta_1$  with the direction of movement  
6 wherein said adaptation of the cross-section of the piston in a plane perpendicular to the  
7 direction of movement corresponds with a change in said angles ( $k_2, \eta_2$ ).

1           19.    The [A] device comprising a combination of a chamber and a piston  
2 according to claim 7, [characterized by the fact that] wherein said sealing portion  
3 comprise a sealing edge [(48, 58, 83, 102, 102', 117, 129, 167, 167', 188, 198, 198', 220,  
4 220', 235)] which is engaging the wall [(2, 3, 4, 5, 61, 62, 63, 64, 65, 155, 156, 157, 158,  
5 207, 238)] of said chamber [(1, 21, 60, 70, 90, 169, 216, 231)], wherein said adaptation

6 additionally is accompanied by a change in the size and/or shape of said sealing edge  
7 under the influence of said loading means.

1        20.    The [A] device comprising a combination of a chamber and a piston  
2 according to claim 19, [characterized by the fact that] wherein said loading means  
3 provides a spring-force to the sealing edge [(48, 58, 83, 102, 102', 117, 129, 167, 167',  
4 188, 198, 198', 220, 220', 235)] so that said piston [(20, 20', 36, 36', 49, 49', 50, 50', 59,  
5 59', 76, 76', 92, 92', 118, 118', 138, 138', 146, 146', 168, 168', 189, 189', 208, 208', 222,  
6 222', 222'')] engages the wall [(2, 3, 4, 5, 61, 62, 63, 64, 65, 155, 156, 157, 158, 207,  
7 238)] of the chamber [(1, 21, 60, 70, 90, 169, 216, 231)] with a sealing force.

1        21.    The [A] device comprising a combination of a chamber and a piston  
2 according to claim 20, [characterized by the fact that] wherein said loading means  
3 comprise:  
4 [-]    a medium [(103, 103', 124, 124, 136, 137, 173, 173', 174, 174', 205, 205', 206,  
5 215, 215', 219', 232, 233, 237)],  
6 [-]    a layer of fibers [(111, 130, 171)] which can freely shear over each other or a layer  
7 of a reinforcement [(51, 100)],  
8 [-]    said fibers are embedded in a skin [(110, 110', 170, 170')] made of rubber or a  
9 thermoplast,  
10 [-]    positioned inside said piston [(92, 92', 146, 146', 168, 168', 208, 208', 222, 222',  
11 222'')] and/or inside the wall [(238)] of the chamber [(231)] which has a predetermined  
12 pressure at said first position, and which can have a different pressure at said second  
13 position.

1        22.    The [A] device comprising a combination of a chamber and a piston  
2 according to claim 19 [or 20] in which [the] said piston is connected to the piston rod for  
3 moving the piston in the direction of movement [characterized by the fact that] wherein  
4 said piston [(92, 146, 168, 208, 222)] and/or said chamber [(231)] comprise loading  
5 regulating means [(103, 110, 123, 124, 125, 126, 127, 137, 138, 139, 140, 141, 145, 170,  
6 173, 177, 178, 179, 199, 200, 201, 206, 215, 223, 224, 232)] providing a sealing force



7 [-] which adjusts [adjust] itself so that the sealing edge [(102, 102', 129, 129', 167,  
8 167', 198, 198', 220, 220' 235)] seals against the wall of the chamber during said  
9 movement between and including said first position and said second position, and

10 [-] said sealing force depends on the relative position of said piston and said chamber  
11 and/or on the pressure of a medium in the chamber, and/or the operating force, and/or a  
12 spring-force.

1 23. The [A] device comprising a combination of a chamber and a piston  
2 according to claim 22 in which [the] said piston is connected to a piston rod for moving  
3 the piston in the direction of movement, [characterized by the fact that] wherein

4 [-] the piston rod [(120, 195)] of the piston [(146, 208)] comprises a channel [(125)]  
5 which is connected by a hole [(123, 199, 200, 201)] in the wall of said piston rod to a  
6 medium [(124, 205, 206)] of the piston [(146,208)], so that a medium can be conducted  
7 through said hole [(123, 199, 200, 201)],

8 [-] said channel [(125)] comprises a piston [(126)] which is engaging said medium by  
9 a spring-force.

1 24. The [A] device comprising a combination of a chamber and a piston  
2 according to claim 22 in which [the] said piston is connected to a piston rod for moving  
3 the piston in the direction of movement, [characterized by the fact that] wherein,

4 [-] the piston rod [(140)] of said piston comprises a channel which is connected by a  
5 hole [(199, 200, 201)] in the wall of said piston rod to a medium [(136, 137)] of the  
6 piston, so that a medium can be conducted through said hole [(199, 200, 201)],

7 [-] a cap which is connecting the piston to said piston rod [(140)] comprises a stop  
8 [(145)] for preventing said piston to disassemble from said piston rod [(140)], and

9 [-] said channel comprises a piston [(138)] which is engaging said medium [(136,  
10 137)] by the operational force.

1           25.    The [A] device comprising a combination of a chamber and a piston  
2 according to claim 22 in which [the] said piston is connected to a piston rod for moving  
3 the piston in the direction of movement, [characterized by the fact that] wherein  
4 [-]       the piston rod [(224)] of the piston [(222)] comprises a channel [(221)] which is  
5 connected by a hole in the wall of said piston rod to a medium [(215, 219)] of the piston  
6 [(222)], so that a medium can be conducted through said hole,  
7 [-]       said channel [(221)] comprises a piston [(149)] which is engaging said medium by  
8 a spring-force of a piston [(148)] which is connected by a piston rod [(217)], and which is  
9 engaged by a medium in the chamber [(216)].

1           26.    The [A] device comprising a combination of a piston and a chamber  
2 according to claim 1[, 2 or 3] in which the said piston is connected to the piston rod for  
3 moving the piston in the direction of movement, [characterized by the fact that] wherein  
4 said piston [(168, 168', 208, 208', 222, 222', 222'')] and/or chamber [(231)] comprise  
5 shape regulating means [(177, 179, 191, 192, 202, 203, 196, 197, 211, 212, 213, 214)].

1           27.    The [A] device comprising a combination of a piston and a chamber  
2 according to claim 26, [characterized by the fact that] wherein,  
3 [-]       a cap [(177, 191, 192, 211, 212, 213, 214)] is movable over the piston rod [(176,  
4 195, 224)] in a predetermined direction,  
5 [-]       defined by a stop [(196, 197)] or a cap [(175)] which is fastened to the piston rod  
6 [(176)],  
7 [-]       a sealing device [(172)] and/or an impervious layer [(190)] which is tightly  
8 squeezed between the skin [(170)] and said caps [(191, 192, 211, 212, 213, 214)] and  
9 sealing device [(202, 203)] prevent the medium or media to escape from the piston [(168,  
10 168', 208, 208', 222, 222', 222'')].

1           28.    The [A] device comprising a combination of a piston and a chamber  
2 according to claim 27, [characterized by the fact that] said movement is [-] damped by a  
3 spring [(178)], and [-] is limited by a stop [(179)].

1           29.    The [A] combination of a piston and a chamber according to claim 1[, 2 or  
2   3] in which [the] said piston is connected to a piston rod for moving the piston in the  
3   direction of movement, [characterized by the fact that] wherein: [the]

4   [-]    the piston rod [(6, 23)] comprises an inlet and a channel [(191)] for conducting  
5   pumped gaseous and/or liquid media into the chamber [(1, 21, 60, 70, 231)], and

6   [-]    the piston rod [(6, 23)] further comprises a valve [(13)] for preventing the pumped  
7   gaseous and/or liquid media from escaping the chamber [(1, 21, 60, 70, 231)] through  
8   [the] said channel [(12)].

1           30.    The [A] combination of a piston and a chamber according to claim 1[, 2 or  
2   3 characterized by the fact that] wherein:

3   [-]    the chamber [(90)] comprises [comprise] an inlet channel [(94)] for conducting  
4   pumped gaseous and/or liquid media into said chamber [(90)], wherein said inlet channel  
5   [(96)] comprises a valve for preventing the pumped gaseous and/or liquid media from  
6   escaping the chamber through said inlet channel [(91)].

1           31.    The [A] device comprising a combination of a chamber and a piston  
2   according to claim 1[, 2 or 3,] in which the chamber comprises an outlet channel and/or  
3   an inlet channel for conducting pumped gaseous and/or liquid media out of the chamber,  
4   [characterized by the fact that] wherein the second position is closer to the outlet channel  
5   [(14, 77, 93)] than the first position, so that the cross-section of the chamber [(1, 21, 60,  
6   70, 90, 162, 169, 216, 231)] diminishes from the first position towards the second  
7   position.

1           32.    The [A] device comprising a combination of a chamber and a piston  
2   according to claim 31, [characterized by the fact that] wherein said outlet channel [(93)]  
3   comprises a valve for preventing the pumped gaseous and/or liquid media to be  
4   conducted into said chamber.

1           33.    The [A] device comprising a combination of a chamber and a piston  
2 according to claim 1[, 2 or 3] in which [the] said piston is connected to a piston rod for  
3 moving the piston in the direction of movement, characterized by the fact that said  
4 chamber is closed and comprises a medium which is [non-compressable] non-  
5 compressible, while said piston comprises valve means for conducting the said medium.

1           34.    The [A] device comprising a combination of a chamber and a piston  
2 according to claim 1[, 2 or 3] in which said piston is connected to a piston rod for moving  
3 the piston in the direction of movement, [characterized by the fact that] wherein said  
4 chamber is closed and comprises a medium which is compressible [compressable]  
5 between said piston and a wall of said chamber.

1           35.    The [A] device comprising a combination of a chamber and a piston  
2 according to claim 1[, 2 or 3] in which said piston is connected to a piston rod for moving  
3 the piston in the direction of movement, [characterized by the fact that] wherein said  
4 device comprises valve means and valve regulating means in order to selectively conduct  
5 a medium in or out of the space between said piston and said chamber.

1           36.    The [A] device comprising a combination of a chamber and a piston  
2 according to claim 1[, 2 or 3] in which said piston is connected to a piston rod for moving  
3 the piston in the direction of movement, [characterized by the fact that] wherein said  
4 chamber or said piston is connected to an axis in order to transform the translation of the  
5 piston and/or the chamber into a rotation, where the chamber comprises valve means and  
6 valve regulating means for selectively conducting and not conducting a medium to the  
7 space between the said piston and said chamber in order to move said chamber and/or  
8 piston.

1           37.    The [A] device comprising a combination of a piston and a chamber  
2 according to claim 22 [characterized by the fact that] wherein the pressure inside the  
3 piston and/or inside the wall of the chamber is higher, equal or lower than the pressure in  
4 the chamber.

1           38.    The [A] device comprising a combination of a piston and a chamber  
2   according to claim 22, [characterized by the fact that] wherein the pressure inside the  
3   piston is higher, equal or lower than the pressure in the wall of the chamber.

1           39.    The [A] device comprising a combination of a piston and a chamber  
2   according to claim 37 [or 38], [characterized by the fact that] wherein the piston and/or  
3   the chamber comprise supporting means.